

Claim 4 is canceled. Therefore, claims 1-3, 5-15 and 25-38 remain for consideration.

Claims 6 and 11 are amended to address the 35 USC §112, second paragraph rejection noted in the Official Action.

Claims 1-6, 11, 15 and 35-38 are rejected as anticipated by TAKAHASHI et al. JP 11-186033.

Reconsideration and withdrawal of the rejection are respectfully requested because the reference does not disclose or suggest that an iron carbide film has a body-centered tetragonal structure and a c-axis constitutes an axis of hard magnetization and, a c-plane constitutes a plane of easy magnetization, as recited in claim 1 of the present application.

By way of example, an object of the present invention is a magnetic thin film that is used for magnetic heads. The plane of easy magnetization of the magnetic film is a direction horizontal to the substrate surface. As disclosed on page 25, line 20, through page 26, line 24 of the present application, a vibrating sample magnetometer (VSM) is used to measure the magnetization of iron carbide film. As seen in Figures 6-8 of the present application, it is difficult for the iron carbide film to magnetize the $\langle 001 \rangle$ direction and is easy to magnetize the $\langle 001 \rangle$ direction and the $\langle 110 \rangle$ direction.

As shown in the accompanying drawing submitted for illustrative purposes only, the present invention has a c-plane that constitutes a plane of easy magnetization. Such a thin film

having the axis direction of magnetization of the magnetic film in a direction horizontal to the substrate possesses a high saturation magnetic flux density (1.5 T or more) and a low coercive force (2 Oe or less) set forth on page 27, lines 6-13 of the present application and as seen in Figures 9 and 10.

TAKAHASHI et al. teach at paragraph [0010] that the axis direction of easy magnetization of the magnetic film lies perpendicular to a film surface in a direction vertical to the film surface. Such is seen in the accompanying illustrative figure denoted PRIOR ART. Specifically, TAKAHASHI et al. disclose a vertical-magnetic recording medium.

Paragraph [0008] of TAKAHASHI et al. states that the purpose of the invention is to have a high saturation magnetic flux density with large coercive force. This is obtained by having a plane of easy magnetization of magnetic film in a direction vertical to the substrate surface.

Since TAKAHASHI et al. is directed to a magnetic recording medium and not a magnetic head, the requirements of the film are much different. Specifically, the large coercive force of TAKAHASHI et al. (paragraph 0018) discloses 6.8 kOe, 4.1 kOe or 4.3 kOe. TAKAHASHI et al. does not teach or suggest a low coercive force of 2 Oe or less or preferably 1 Oe or less, as is obtained by having a c-axis that constitutes an axis of hard magnetization and a c-plane constituting a plane of easy magnetization, as recited in claim 1 of the present application.

As the references does not disclose that which is recited, the anticipation rejection is not viable. Accordingly, reconsideration and allowance of claim 1 are respectfully requested.

Claims 2, 3, 5, 6, 11, 15, and 35-38 depend from claim 1 and further define the invention and are also believed patentable over TAKAHASHI et al.

Claims 7, 8, and 10 are rejected as unpatentable over TAKAHASHI et al. in view of HORI et al. 5,068,147. This rejection is respectfully traversed.

HORI et al. is cited for the teaching of the relationship of carbon in an FeC film and nitrogen in an FeC film. As noted in the Official Action, HORI et al. was merely cited for these features and does not teach or suggest what is recited in claim 1. As set forth above, TAKAHASHI et al. do not disclose or suggest what is recited in claim 1. Since claims 7-8 and 10 depend from claim 1 and further define the invention, the combination of references would not render obvious claims 7-8 and 10.

Claims 9, 11-12 and 14 are rejected as unpatentable over TAKAHASHI et al. in view of HORI et al. 5,006,395. This rejection is respectfully traversed.

HORI et al. is cited for the teaching of adding cobalt as a third element to an FeC film and teaching a substrate film having almost the same lattice constant as that of the FeC film.

HORI et al. do not teach or suggest what is recited in claim 1. As set forth above, TAKAHASHI et al. do not disclose or suggest

what is recited in claim 1. Since claims 9, 11-12 and 14 depend from claim 1 and further define the invention, the combination of references would not render obvious claims 9, 11-12 and 14.

Claim 13 is rejected as unpatentable over TAKAHASHI et al. in view of OHNAMI et al. 6,255,006. This rejection is respectfully traversed.

OHNAMI et al. is recited for the teaching that a magnetic layer adopts a crystal structure of the layer upon which it is grown. OHNAMI et al. do not disclose or suggest what is recited in claim 1 of the present application. As set forth above, TAKAHASHI et al. do not disclose or suggest what is recited in claim 1. Since claim 13 depends from claim 1 and further defines the invention, the combination of references would not render obvious claim 13.

Claims 1 and 25-29 are rejected as unpatentable over WADA et al. 4,953,051 in view of TAKAHASHI et al., and further in view of The Wiley Encyclopedia of Electrical and Electronics Engineering, December 27, 1999. This rejection is respectfully traversed.

Claim 1 was amended to include the subject matter of claim 4. Since the above combination of references was not applied against claim 4, claim 4 is believed patentable over the above combination of references. Accordingly, claim 1 is believed patentable over the cited references. Since claims 25-29 depend from claim 1 and further define the invention, these claims are also believed patentable over the cited prior art.

Claims 1, 32-33 are rejected as unpatentable over TANAKA et al. 5,854,727 in view of TAKAHASHI et al. This rejection is respectfully traversed.

As noted above, claim 1 is amended to include the subject matter of claim 4. TANAKA et al. in view of TAKAHASHI et al. were not applied against claim 4, and thus claim 1 as amended is believed patentable over TANAKA et al. in view of TAKAHASHI et al. Claims 32 and 33 depend from claim 1 and further define the invention and are also believed patentable over the cited prior art.

Claims 1 and 30-31 are rejected as unpatentable over REED et al. WO 93/129028, and further in view of TAKAHASHI et al. and The Wiley Encyclopedia of Electrical and Electronics Engineering. This rejection is respectfully traversed.

Claim 1 was amended to include the subject matter of claim 4. The above-noted references were not applied against claim 4 and thus claim 4 is believed patentable over the above-cited art. Accordingly, claim 1 as amended is believed patentable over the above-cited art. Claims 30 and 31 depend from claim 1 and further define the invention and are also believed patentable over the cited prior art.

In view of the present amendment and the foregoing remarks in conjunction with the illustrative figures submitted with the amendment, it is believed that the present application has been placed in condition for allowance. Reconsideration and allowance are respectfully requested.

TAKAHASHI et al. S.N. 09/720,736

Attached hereto is a marked-up version of the changes made to the abstract and claims. The attached page is captioned "VERSION WITH MARKINGS TO SHOW CHANGES MADE."

Respectfully submitted,

YOUNG & THOMPSON

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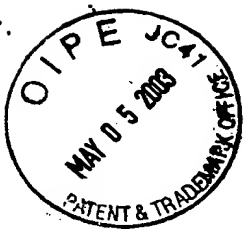
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ABSTRACT OF THE DISCLOSURE

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--A magnetic thin film with a saturation magnetic flux density of 2T or more and a coercive force of 2 Oe or less for a magnetic pole material of a recording head. The magnetic thin film consists of an iron carbide film that includes a martensite (α') phase as the principal phase and at least carbon and iron as constituent elements. The iron carbide film preferably consists of a single α' phase. The iron carbide film has a body-centered tetragonal structure and a c-axis constitutes an axis of hard magnetization and, a c-plane constitutes a plane of easy magnetization. The axis of hard magnetization constitutes a direction which is generally perpendicular to the film surface, and the plane of easy magnetization constitutes a direction which is generally parallel to the film surface.--



TAKAHASHI et al. S.N. 09/720,736

VERSION WITH MARKINGS TO SHOW CHANGES MADE

IN THE CLAIMS:

The claims were amended as follows:

--1. (amended) A magnetic thin film consisting of an iron carbide film, said iron carbide film comprising an α' phase as a principal phase and at least carbon and iron as constituent elements,

wherein said iron carbide film has a body-centered tetragonal structure and a c-axis constitutes an axis of hard magnetization and a c-plane constitutes a plane of easy magnetization, and

wherein the α' phase is a martensite phase.--

--6. (amended) A magnetic thin film according to claim 4, wherein said axis of hard magnetization constitutes a direction which is [generally] perpendicular to the film surface and said plane of easy magnetization constitutes a direction, which is [generally] horizontal to the film surface.--

--11. (amended) A magnetic thin film according to claim 1, wherein said iron carbide film is formed on a surface of a thin film having [almost the same] an interatomic distance [as] that is within $4\text{\AA} \pm 10\%$ of said iron carbide film.

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--12. (amended) A magnetic thin film according to claim 11, wherein the principal element constituting said thin film has [almost the same] lattice constants [as] that are within $4\text{\AA} \pm 10\%$ of those of said iron carbide film.--

IN THE ABSTRACT:

The Abstract of the Disclosure was amended as follows:

--[The present invention provides a] A magnetic thin film[, which can be produced by the same dry process as that in case of a magnetoresistive element constituting a read head and has excellent soft magnetic characteristics] with a saturation magnetic flux density of 2T or more and a coercive force of 2 Oe or less[, which are suited] for [use as] a magnetic pole material of a recording head[, a method of producing the same, and a magnetic head, a magnetic recording device, and a magnetic device using the same]. The magnetic thin film [of the present invention has the feature that it] consists of an iron carbide film[, said iron carbide film comprising] that includes a martensite (α') phase as the principal phase and at least carbon and iron as constituent elements. The iron carbide film preferably consists of a single α' phase. [The iron carbide film is a magnetic thin film specified by the fact that a diffraction peak from the (002) plane of the α' phase is observed as a principal peak by means of an X-ray diffraction method or an electron diffraction method in said iron carbide film.] The iron

carbide film has a body-centered tetragonal structure and [an] a c-axis constitutes an axis of hard magnetization and, [furthermore,] a c-plane constitutes a plane of easy magnetization. The axis of hard magnetization constitutes a direction which is generally perpendicular to the film surface, and the plane of easy magnetization constitutes a direction which is generally parallel to the film surface.--